

TB233 (Rev1) - Fanuc Yellow Cap Motor/Velocity Control Drive Setup for CNC11 Systems

The Fanuc Velocity Control Unit is a servo drive that is used to drive the Fanuc Yellow-Cap and Black-Cap motors. This document describes how an MPU11 system is setup to use the drive and motor. Due to the requirements of the Fanuc drive an Optic4 must, in most cases, be used to run them. GPIO4D is the PLC and can be the drive if, in rare cases, there is an encoder on the ballscrew and a tach on the motor. In this case the GPIO4D can be used because no tach output is needed.

Jumpers on the Fanuc Drive

The drive has many jumpers in several locations and 5 potentiometers. The configuration of the jumpers and potentiometers on the reference system built by Centroid is detailed in the following table. The Fanuc documentation name is listed as well. It is best not to change these jumpers from the settings they were at on the running system as there may be other optional accessories on the drives that require different jumper settings. Centroid cannot make recommendations about modifications to the jumper settings at this time.

Jumper	Installed	Description
S1	Yes	Tacho-Gen Setting
S2	No	Tacho-Gen Setting
S3	No	Compressor Enable
S4	No	Gain Attenuator
S5	Yes	High Frequency Gain
S6	Yes	High Frequency Gain
S7	Yes	Ripple Filter
S8	Yes	High-Gain C.K.T. Enable
S9	No	Capacitor for compensation C.K.T.
S10	Yes	Capacitor for compensation C.K.T.
S11	No	Capacitor for compensation C.K.T.
S12	Yes	DC Gain
S13	No	DC Gain
S14	No	Capacitor for High-Gain
S15	No	Set same as S15
S16	Yes	Chopping Frequency Selector
S20	No	Thermostat for xformer and Dischare unit enable
S21	No	Brake Alarm Enable
S22	No	DCAL Alarm Enable
S23	No	TGLS Alarm Enable
S24	Yes	OVC Alarm operating time selector
S25	No	TGLS Alarm sensing level
S26	Yes	Discharge Unit Selector
SL126	No	Motor Selector for Armature Voltage Feedback

*Note: The spare jumpers are numbered high to low starting closest to RV4. Their function is unknown at this time and it is recommended to leave them as they are set.

Potentiometers on the Fanuc Drive

The Potentiometers RV1, RV2, and RV4 should be set to 50% before applying power to the drive. RV3 and RV5 should be left alone. RV2 may need to be adjusted to remove an offset to the analog command input, though only if there is a significant offset present.. It should be checked on the smallest DC scale available with a multimeter while slowly turning RV2.

Optic4 Hardware Setup

There is a jumper, J13, that needs to be installed on the Optic4 for the Active High outputs to match the polarity that the Fanuc drive expects. The AC voltage for the E-Stop contactor coil should go through the E-Stop Relay 1 and 2 on H2 (and the E-Stop button) so that the Fanuc drive cannot become enabled until CNC11 is up and running the PLC program.

PLC Logic

There are several things in the PLC program that need to be added for a Fanuc system. There are two different enable signals to the Fanuc Drive. PRDY and ENB serve two different functions. PRDY turns on the contactor in the drive and should be set when E-Stop is released. ENB should be turned on when the specific axis is enabled and commanded to hold. The fault signal from the Fanuc drive also needs to be read so that proper notification is given to the user. There is not a reset input on the Fanuc drive so any error from the drive is fatal and should not be cleared. A message should be given to indicate the system needs to be powered off and back on. Following is a snippet for checking the fault input and setting enable signals.

Set PRDY input on the Fanuc drive

```
;set the 14th bit of word 5 to 1 if there are no faults
IF !SV_STOP && SV_MASTER_ENABLE THEN BITSET w5 14
IF SV_STOP || !SV_MASTER_ENABLE THEN BITRST w5 14
;set the Aux output on the Optic4 high or low
IF true THEN SV_DRIVE_CONTROL_2 = w5
```

Set ENB input on the Fanuc Drive

```
;enable the first axis if CNC11 says it should turn on
;later fault checking will cause a fault if it exists
IF SV_PC_POWER_AXIS_1 THEN (SV_ENABLE_AXIS_1)
```

Check for Drive Fault from Fanuc Drive

```
;read the status word containing the Optic4 fault input.
;the fault input is bit 15 in the word so divide by 2^15 = 32768 to get one or zero
w7 = (SV_DRIVE_STATUS_3 / 32768)
;set the drive fault status if there is an error on any axis
IF (w7 == 1) THEN SET SV_DRIVE_FAULT
```

CNC11 Configuration

Fanuc Yellow Cap systems take a tachometer input rather than encoder feedback. CNC11 parameters 200-207 set the Tach. output on the Optic4 and should be set according to the type of Fanuc drives are in the system. The values entered are Tach. volts/1000RPM and determine the way the Tach. speed is reported to the Drive on the Tach. output pin on the Optic4. The following table shows what value should be entered in each parameter.

Drive Type	Tach. Volts / 1000 RPM
H00, H0, H5	3
H10, H20, H30	6

CNC11 parameters 300-315 setup the drive and encoder map for the system. A standard 4 axis mill setup should be configured according to the following table. This table assumes using the four encoder inputs on the Optic4 for the 4 drives' feedback. It also assumes a spindle encoder coming into the first MPU11 onboard encoder. Parameter 35 would be set to 4 in this case. For a typical lathe setup only the first two axes need to be entered, but setting the parameters will not have adverse effects.

Parameter	Value
300	1
301	2
302	3
303	4
304	0
305	0
306	0
307	0
308	7
309	8
310	9
311	10
312	1
313	0
314	0
315	0

PID Settings

Initial PID Settings for tuning are in the following table.

Parameter	Value
Kp	0.02
Ki	0.0004
Kd	0.02
Kv1	65
Accel	0.25

GPIO4D to Fanuc DC Drive

This is for the atypical Fanuc system that is wired with the encoder on the ballscrew and a resolver on the motor. [Click here to see the full size drawing.](#)

<Image Forthcoming>

Document History

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